Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of Part 90	)	WT Docket No. 07-100
of the Commission's Rules	)	

COMMENTS OF THE
NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

The National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (CORF),[1] hereby submits its comments in response to the Commission's May 14, 2007, Notice of Proposed Rulemaking in the above-captioned docket (NPRM). In these comments, CORF notes its concern about the potential impact of proposed permanent fixed microwave operations in the 4940-4990 MHz (4.9 GHz) band on radio astronomy observations. Accordingly, if the Commission decides to authorize such permanent fixed operations, it should enact rules requiring prior frequency coordination of such operations, in order to protect radio astronomy observations.

I. Introduction: The Importance of RAS Observations in the 4.9 GHz Band, and the Unique Vulnerability of Passive Services to In-Band and Out-of-Band Emissions.

CORF has a substantial interest in this proceeding, as it represents the interests of the scientific users of the radio spectrum, including users of the Radio Astronomy

[1] A list of CORF members is given in the attachment.

Service (RAS). Radio astronomers perform extremely important yet vulnerable research.

As the Commission has long recognized, radio astronomy is a vitally important tool used by scientists to study our universe. Through the use of radio astronomy, scientists have in recent years discovered the first planets outside the solar system, circling a distant pulsar. Measurements of radio spectral line emission have identified and characterized the birth sites of stars in our own galaxy and the complex distribution and evolution of galaxies in the universe. Radio astronomy measurements have discovered ripples in the cosmic microwave background, generated in the early universe, which later formed the stars and galaxies we know today. Observations of supernovas have allowed us to witness the creation and distribution of heavy elements essential to the formation of planets like Earth, and of life itself.

As passive users of the spectrum, radio astronomers have no control over the frequencies at which they must observe or over the character of the "transmitted" signal. These parameters are set by the laws of nature. Furthermore, the emissions that radio astronomers detect are extremely weak--a typical radio telescope receives only about one-trillionth of a watt from even the strongest cosmic source, and many orders of magnitude less from the weakest. Because radio astronomy receivers are designed to pick up such remarkably weak signals, such facilities are therefore particularly vulnerable to interference from spurious and out-of-band emissions from licensed and unlicensed users of neighboring bands, and those that produce harmonic emissions that fall into the RAS bands.

Of particular concern in this proceeding is protection of RAS observations in the 4.9 GHz band. Radio astronomy observations in the 4.9 GHz band are extremely useful in studying the brightness distributions of objects such as ionized hydrogen clouds surrounding young stars, remnants of supernovas that mark the cataclysmic end of stars, and ejecta traveling at nearly the speed of light from black holes in the nuclei of galaxies. Such observations allow scientists to construct detailed maps of such phenomena, to understand their structures and dynamics, and to derive physical parameters from the sources, such as their total masses. Observations of radio emissions from neutron stars and black holes are particularly sensitive to interference because of their variability, and it is not possible to re-observe such phenomena at a later time. The current benefits of this scientific research, obtained through years of work and substantial federal investment, as well as future benefits, must be protected.

In recognition of the importance of the radio astronomy research done in the 4.9 GHz band, Footnote US311 states that at "4950-4990 MHz, every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed and mobile services that could interfere with radio astronomy observations within the geographic areas given" at certain RAS observatories listed therein.[2] Similarly, Footnote US342 states that "[i]n making assignments to stations of other services to which the bands . . . 4950-4990 MHz . . . are allocated . . . , all practicable steps shall be taken to protect the radio astronomy service from harmful interference," and does not limit that protection to

---

[2] See 47 C.F.R. § 2.106.

only the RAS observatories listed in Footnote US311.[3]

II. If the Commission Authorizes Permanent Fixed Microwave Operations at 4.9 GHz, Such Operations Should Be Subject to a Prior Coordination Requirement.

In paragraph 22 of the NPRM, the Commission seeks comments on a proposal to authorize permanent fixed operations in the 4.9 GHz band. The proponent of such operations asserts that there is an ambiguity in Section 90.1207(d) as to whether such operations are permissible, and seeks clarification that they are. CORF believes that Section 90.1207(d) clearly prohibits such operations by stating that a "4940-4990 MHz license does not give the licensee authority to operate permanent fixed point-to-point stations."[4] CORF recognizes the important work performed by public safety agencies and the role that 4.9 GHz spectrum might play in facilitating that work. However, CORF believes that protection of scientific research is also important, and if the Commission chooses to revise its rules to allow permanent fixed operations in the 4.9 GHz band, radio astronomy observations can and should be protected in a practical manner that is no more burdensome for 4.9 GHz fixed operations than that required of other similarly situated fixed microwave operations.

This is not the first time this issue has arisen, and a brief historical review is helpful here. As the Commission acknowledged in paragraph 13 of the *4.9 GHz Band Second Report and Order*, CORF has previously suggested that in order to best protect radio astronomy observations from interference as required in Footnote US311, fixed stations within the geographic areas designated in that footnote should be required to

---

[3] See 47 C.F.R. § 2.106.

coordinate their operations with observatories.[5] CORF still believes that this is the best approach. The Commission rejected those suggestions in paragraph 17 of that *Report and Order*, in large part based on the premise that any 4.9 GHz operations within the vicinity of RAS observatories "would likely be short-term."

However, the new proposal for permanent fixed operations in the current NPRM negates the premise previously used by the Commission to deny the coordination requirement. The proposed 4.9 GHz operations would no longer be "short-term." Rather, the operations on which comments are sought would be permanent and thus are perfectly appropriate for coordination with RAS facilities: unlike mobile operations in which interference to nearby RAS observatories would be significant but only temporary, permanent 4.9 GHz facilities could result in permanent interference to RAS observations. Furthermore, unlike mobile operations, which are very difficult or impossible to coordinate, or temporary operations, in which the coordination process could take longer than the projected use of the 4.9 GHz facilities, permanent 4.9 GHz facilities can easily be coordinated, and the time necessary to fulfill the coordination process is very short compared with the long-term permanent use of such facilities. Factoring in time for frequency coordination in the construction process is required for commercial and public safety operators in other fixed microwave bands,[6] and should be no more burdensome in this case.

Thus, CORF recommends that if the Commission chooses to revise its rules to

---

4 See 47 C.F.R. § 90.1207(d).
5 *4.9 GHz Band Second Report and Order*, 17 FCC Rcd 3955, 3963-64 (2002).
6 *See*, Section 101.103 of the Commission's Rules.

allow permanent fixed operations in the 4.9 GHz band, the rules should also be revised to require such operations within the geographic areas denoted in Footnote US311 to undertake prior frequency coordination *vis-à-vis* the affected RAS observatory. CORF recommends that such operators coordinate with the Electromagnetic Spectrum Manager of the National Science Foundation.[7]

III. Conclusion

CORF is greatly concerned about the potential impact of permanent fixed operations in the 4.9 GHz band on radio astronomy observations. Accordingly, any rules for operation of such facilities should require prior frequency coordination, as set forth above.

Respectfully submitted,

NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

By: _____
Ralph Cicerone
President

August 13, 2007

Direct correspondence to:

CORF
Keck Center of the National Academies
500 Fifth St., NW, MS W922
Washington, DC 20001
(202) 334-3520

[7] *See, e.g.*, Section 15.615(3)(C)(ii) of the Commission's Rules. *See also*, Sections 15.242(e), 25.213(a)(1)(v), and 95.1119 of those Rules.

Attachment

CORF Membership List:

Paul A. Vanden Bout, National Radio Astronomy Observatory, *Chair*
Jeffrey Piepmeier, NASA Goddard Space Flight Center, *Vice Chair*
Steven Ellingson, Virginia Tech
David G. Long, Brigham Young University
James M. Moran, Harvard University
Melinda Piket-May, University of Colorado at Boulder
Steven C. Reising, Colorado State University
Lucy Ziurys, University of Arizona

Michael Davis, SETI Institute (retired) *Consultant*
Paul Feldman, Fletcher, Heald, and Hildreth, *Consultant*
A. Richard Thompson, National Radio Astronomy Observatory, *Consultant*